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PATENT APPLICATION

U.S. Patent Application

By

Irah H. Donner

For

INTELLECTUAL PROPERTY AUDIT SYSTEM

TELETYPE UNIT

8/17

TITLE OF THE INVENTION

INTELLECTUAL PROPERTY AUDIT SYSTEM

Sub A

RELATED APPLICATIONS

This application is a continuation-in-part application of U.S. patent application serial number 08/161,816, filed December 8, 1993, entitled "INTELLECTUAL PROPERTY AUDIT SYSTEM," incorporated herein by reference.

Sub A

1 BACKGROUND OF THE INVENTION

2 Field of the Invention

3 The present invention generally relates to the
4 field of intellectual property audit systems, and more
5 particularly, to the field of intellectual property
6 systems which collects pertinent data regarding an
7 intellectual property portfolio and analyzes the
8 collected data against empirical data to provide a
9 qualitative and/or quantitative analysis of the
10 intellectual property portfolio.

11 Description of the Related Art

12 In general, purchasers of assets which are
13 intellectual property intensive typically purchase
14 these assets based upon some estimated value which, of
15 course, begins with an offer for sale. When a creditor
16 is considering advancing funds based upon the value of
17 fixed assets, such as equipment, an appraisal is
18 performed and a liquidation value is determined. Then

1 a liquidity adjustment is considered and a liquidation
2 value is concluded. The same valuation approaches can
3 be employed to determine the liquidation value of
4 intellectual property. It is known to value
5 intellectual property assets with respect to various
6 accounting procedures which conform to Generally
7 Accepted Accounting Procedures (GAAP). There are
8 typically three such procedures: cost, market and
9 income approaches.

10 The cost approach gives consideration to the cost
11 to reproduce or replace the subject intellectual
12 property. For example, for patent intellectual
13 property, this approach would consider the cost
14 associated with research, engineering, design and
15 testing activities. In trademark cases the advertising
16 expenses that would be needed to create a trademark of
17 similar prominence would be considered.

18 From this amount an allowance is deducted to
19 reflect all forms of depreciation or obsolescence
20 present, whether it arises from physical, functional or
21 economic causes. Physical deterioration (depreciation)
22 is the loss in value resulting from wear and tear from
23 operations and exposure to the elements. Functional
24 obsolescence is the loss in value within the property
25 as a result of such things as changes in design,
26 materials, or processes, overcapacity, inadequacy,
27 excess construction, lack of utility, and excess
28 operating cost. Economic obsolescence is the loss in
29 value that results from influences external to the
30 property such as the general state of economy, the
31 effect of governmental regulations, and the like. A

1 summary of the cost approach is presented below.

2 Replacement cost

3 Less: Physical Depreciation

4 Less: Functional Obsolescence

5 Less: Economic Obsolescence

6 Equals: Fair Market Value

7 Physical and functional obsolescence is not
8 usually an important factor when valuing intellectual
9 property but care is needed to consider the economic
10 obsolescence that can be introduced by outside forces.

11 Unfortunately the cost to develop intellectual
12 property rarely bears any relationship tot he economic
13 earning power of the property or the value of the
14 property.

15 The market approach gives consideration to prices
16 paid for similar property in arm's length transactions.
17 Adjustments can be made, if necessary, to the indicated
18 market prices to reflect the condition and utility of
19 the property being appraised relative to the market
20 comparative. This approach is applicable where there
21 is an active market with a sufficient quantity of
22 reliable and verifiable data. Usually, similar
23 property that exchanged between independent parties for
24 which price data is disclosed is impossible to find for
25 intellectual properties. The activities of the
26 Resolution Trust Corporation are however beginning to
27 provide some of the previously missing data. At
28 present, the market approach is difficult to implement
29 for intellectual property.

30 The income approach, by default, is still the most

1 preferred method. It considers the present value of
2 the prospective economic benefits of owning the
3 appraised property. This involves a capitalization of
4 the forecasted income stream with consideration given
5 to the duration of the income and the risks related to
6 its achievement.

7 Care must be employed to assure that economic
8 benefits derived from the intellectual property are
9 isolated from the contribution to earnings derived from
10 the complementary assets of the business. When
11 properly done, the income approach can provide an
12 accurate indication of the fair market value of
13 intellectual property. Once the fair market value of
14 the intellectual property portfolio has been
15 determined, then as indicated above, the fair market
16 value is adjusted according to conventional methods
17 which consider effects such as amount of time required
18 to dispose of the portfolio, market evidence of similar
19 intellectual property portfolios sold in liquidation
20 and cost to liquidate the property.

21 These accepted accounting methods rely or function
22 on the availability of sufficient data relating to the
23 intellectual property portfolio itself. Thus, in this
24 situation, the seller of the intellectual property
25 portfolio typically has used and marketed the
26 intellectual property over a sufficiently long time
27 period that suitable data has been collected to
28 formulate a price based upon one of the above
29 accounting valuation techniques. However, these
30 accounting techniques typically do not provide reliable
31 and/or dependable valuation results when the seller of

1 the intellectual property portfolio has not collected
2 data or has not used or marketed the portfolio long
3 enough to obtain such data.

4 In addition, for typical purchases of intellectual
5 property assets, there is typically unavailable an
6 independent indicator of the worth of the intellectual
7 property to be sold. The independent indicator which
8 is lacking may be either a qualitative or quantitative
9 indicator of the worth of the intellectual property
10 portfolio.

11 Accordingly, it is desirable to provide an
12 independent analysis of an intellectual property
13 portfolio including an independent qualitative or
14 quantitative worth indicator of the intellectual
15 property portfolio to be acquired.

16 In addition, it is also desirable to provide an
17 intellectual property audit system that does not depend
18 on the owner of the portfolio having previously used
19 and marketed the portfolio.

20 It is further desirable to provide an intellectual
21 property audit system which can be used to determine
22 the qualitative and/or quantitative value of the
23 intellectual property portfolio in an efficient and
24 relatively rapid manner.

25 It is also desirable to provide the qualitative
26 and/or quantitative value by analyzing the intellectual
27 property itself in a mechanized manner as well as
28 considering external factors relating to, for example,
29 characteristics of the purchasing and selling entities.

30 Finally, it is also desirable that the
31 intellectual property audit system be provided with the

1 ability to output requests for manual assistance to
2 correct, for example, erroneously entered data or
3 incomplete or insufficient data causing the
4 intellectual property audit system to be unable to
5 completely analyze the input data for determining of an
6 intellectual property portfolio value. Accordingly,
7 the audit system permits a user to manually correct or
8 complete data to permit the audit system to determine a
9 qualitative and/or quantitative intellectual property
10 portfolio value.

11 SUMMARY OF THE INVENTION

12 It is, therefore, an object of the present
13 invention to provide an independent analysis of an
14 intellectual property portfolio including an
15 independent qualitative or quantitative worth indicator
16 of the intellectual property portfolio to be acquired.

17 It is also an object of the present invention to
18 provide an intellectual property audit system that does
19 not depend on the owner of the portfolio having
20 previously used and marketed the portfolio.

21 It is also an object of the present invention to
22 provide an intellectual property audit system which can
23 be used to determine the qualitative and/or
24 quantitative value of the intellectual property
25 portfolio in an efficient and relatively rapid manner.

26 It is another object of the present invention to
27 provide the qualitative and/or quantitative value by
28 analyzing the intellectual property itself in a
29 mechanized manner as well as considering external
30 factors relating to, for example, characteristics of

1 the purchasing and selling entities.

2 Further, it is an object of the present invention
3 that the intellectual property audit system be provided
4 with the ability to output requests for manual
5 assistance to correct, for example, erroneously entered
6 data or incomplete or insufficient data causing the
7 intellectual property audit system to be unable to
8 completely analyze the input data for determining of an
9 intellectual property portfolio value. Accordingly,
10 the audit system permits a user to manually correct or
11 complete data to permit the audit system to determine a
12 qualitative and/or quantitative intellectual property
13 portfolio value.

14 To achieve these and other objects, the present
15 invention provides an intellectual property computer-
16 implemented audit system for valuing an intellectual
17 property portfolio. The intellectual property audit
18 system includes a first database storing first
19 information relating to the intellectual property
20 portfolio and a database access and collection device
21 connected to the first database and accessing the first
22 database and retrieving the first information. In
23 addition, the intellectual property audit system also
24 includes a second database storing empirical data
25 relating to known intellectual property portfolios, and
26 a comparison device connected to the database access
27 and collection device and to the second database, the
28 comparison device receiving the first information from
29 the database access and collection device and comparing
30 the first information to the empirical data retrieved
31 from the second database producing an intellectual

1 property worth indicator indicating the worth of the
2 intellectual property portfolio.

3 These together with other objects and advantages
4 which will be subsequently apparent, reside in the
5 details of construction and operation as more fully
6 hereinafter described and claimed, with reference being
7 had to the accompanying drawings forming a part hereof,
8 wherein like numerals refer to like elements
9 throughout.

10 BRIEF DESCRIPTION OF THE DRAWINGS

11 Fig. 1 is a detailed block diagram of the
12 structure of the intellectual property audit system of
13 the present invention;

14 Fig. 2 is a conceptual diagram of the intellectual
15 property audit system of the present invention;

16 Figs. 3-6 are block diagrams illustrating
17 additional embodiments of the pattern matching system;

18 Fig. 7 is an illustration of a main central
19 processing unit for implementing the computer
20 processing;

21 Fig. 8 is a block diagram of the internal hardware
22 of the computer illustrated in Fig. 7; and

23 Fig. 9 is an illustration of an exemplary memory
24 medium which can be used with disk drives illustrated
25 in Fig. 7 or Fig. 8.

26 NOTATIONS AND NOMENCLATURE

27 The detailed descriptions which follow may be
28 presented in terms of program procedures executed on a
29 computer or network of computers. These procedural

1 descriptions and representations are the means used by
2 those skilled in the art to most effectively convey the
3 substance of their work to others skilled in the art.

4 A procedure is here, and generally, conceived to
5 be a self-consistent sequence of steps leading to a
6 desired result. These steps are those requiring
7 physical manipulations of physical quantities.
8 Usually, though not necessarily, these quantities take
9 the form of electrical or magnetic signals capable of
10 being stored, transferred, combined, compared and
11 otherwise manipulated. It proves convenient at times,
12 principally for reasons of common usage, to refer to
13 these signals as bits, values, elements, symbols,
14 characters, terms, numbers, or the like. It should be
15 noted, however, that all of these and similar terms are
16 to be associated with the appropriate physical
17 quantities and are merely convenient labels applied to
18 these quantities.

19 Further, the manipulations performed are often
20 referred to in terms, such as adding or comparing,
21 which are commonly associated with mental operations
22 performed by a human operator. No such capability of a
23 human operator is necessary, or desirable in most
24 cases, in any of the operations described herein which
25 form part of the present invention; the operations are
26 machine operations. Useful machines for performing the
27 operation of the present invention include general
28 purpose digital computers or similar devices.

29 The present invention also relates to apparatus
30 for performing these operations. This apparatus may be
31 specially constructed for the required purpose or it

1 may comprise a general purpose computer as selectively
2 activated or reconfigured by a computer program stored
3 in the computer. The procedures presented herein are
4 not inherently related to a particular computer or
5 other apparatus. Various general purpose machines may
6 be used with programs written in accordance with the
7 teachings herein, or it may prove more convenient to
8 construct more specialized apparatus to perform the
9 required method steps. The required structure for a
10 variety of these machines will appear from the
11 description given.

12 DESCRIPTION OF THE PREFERRED EMBODIMENT

13 The intellectual property audit system according
14 to the present invention may be used as an integrity
15 check for acquisitions having assets involving a
16 substantial intellectual property portfolio. The
17 system could be used to compare the intellectual
18 property portfolio to be acquired with other
19 intellectual property portfolios having known market
20 values to obtain an indicator of the intellectual
21 property portfolio's worth. Depending on the quality
22 of empirical data, the intellectual property audit
23 system of the present invention could provide a
24 qualitative and/or quantitative analysis of an
25 intellectual property portfolio which is to be
26 acquired.

27 Fig. 2 is a conceptual diagram of the intellectual
28 property audit system of the present invention. The
29 intellectual property audit system would operate in
30 general terms as follows. In Fig. 2, the user of the

1 audit system would input the appropriate data to an
2 input device 14. In the most basic form, the input
3 data might simply be a list of patent numbers for an
4 intellectual property portfolio comprising only
5 patents.

6 Next, the data would be transmitted to a database
7 access device 16 which would collect various data from
8 different on-line intellectual property databases 18.
9 The collected data represents different intellectual
10 property worth indicators. Each worth indicator would
11 then be assigned a value which would be approximated
12 using previously collected indicator values which are
13 based on intellectual property portfolios which have
14 known worth or dollar values by consulting empirical
15 database 22. For example, the audit system could
16 access a full text patent database such as DIALOG to
17 analyze the listed patents. Specifically, the system
18 could determine how many claims, dependent and
19 independent, are in each patent. A high value would be
20 assigned to this indicator if there are many claims,
21 indicating that the drafter or owner of the patent
22 considered the patent of significant importance.
23 Additionally, the number of references cited or number
24 of classes searched could also be gathered and a high
25 value assigned to the indicator when the patent lists
26 many classes or many cited references. The rationale
27 for the high value would be that there is reason to
28 believe that the examiner performed a detailed
29 examination leaving the issued patent strong. Further,
30 each patent could also be searched to determine how
31 often the patent itself has been cited as a reference

1 on other patents. Higher values would be assigned to a
2 patent cited more often than not, indicating that the
3 patent was perhaps a breakthrough in a particular
4 field.

5 Similar information could also be collected for
6 trademarks which are included in the intellectual
7 property portfolio from such databases as DIALOG's
8 FEDERAL TRADEMARK SCAN and STATE TRADEMARK SCAN which
9 inventory federal and state trademarks, respectively.
10 Based upon these databases, a user might, for example,
11 determine whether a trademark includes disclaimers to
12 certain words in the trademark and/or how many classes
13 the trademark has been issued for or covers. In
14 addition, ORBIT's LEGAL STATUS database includes recent
15 information affecting the trademark, and LEXIS' NEXIS
16 database could be used to determine any recent
17 information relating to the trademark which has been
18 published in trade magazines or newspapers.

19 Finally, intellectual property which also includes
20 copyrighted work could also be considered in a similar
21 manner. For example, computer software related
22 intellectual property might include both patents on the
23 computer system as well as copyrights on the software
24 itself.

25 Once all the worth indicators have been
26 determined, they are transmitted to an indicator
27 comparing device 20 which would compare the collection
28 of worth indicators to known collections of worth
29 indicators from known intellectual property portfolios
30 stored in empirical database 22. Known distribution or
31 estimation techniques could be used to determine which

1 known intellectual property portfolio the intellectual
2 property portfolio which is to be acquired matches the
3 closest. Finally, the system would output the known
4 portfolio worth value 24 for which the portfolio to be
5 acquired matches the most, signifying a rough
6 approximation of the worth of the portfolio to be
7 acquired. A detailed description of the intellectual
8 property audit system according to the present
9 invention follows.

10 Fig. 1 represents a block diagram representation
11 of the proposed intellectual property audit system. In
12 Fig. 1, data input device 2 is used to input the
13 necessary data representing the intellectual property
14 portfolio to be acquired. This data may be, for
15 example, simply the list of patent numbers in the
16 portfolio, or the data might include additional
17 information relating to the specific intellectual
18 property portfolio or the selling/acquiring entities
19 which might not be readily retrievable from current
20 databases. For example, the additional information
21 might include financial information regarding the
22 selling/acquiring entities or recent performance in the
23 stock market. Data input device 2 is a standard input
24 device and may include, for example, the data entry
25 system in U.S. Patent 4,012,720 or the data entry
26 interface assembly in U.S. Patent 4,638,422, —
27 incorporated herein by reference. In any event, the
28 data is entered and then transmitted to database access
29 and collection device 4.

30 Database access and collection device 4 filters
31 the received data to determine which aspects of the

1 received data are to be further analyzed by retrieving
2 information regarding the data from various on-line
3 databases. For example, database access and collection
4 device 4 would determine that the received patent
5 numbers should be used to analyze the patents while the
6 received financial data might not be further analyzed
7 and simply transmitted to data processor 6 for later
8 evaluation.

9 With respect to the data which is to be analyzed,
10 database access and collection device 4 will access the
11 various databases having information concerning the
12 data to be analyzed and collect the necessary
13 information regarding the data. For example, with
14 respect to the patent number information, database
15 access and collection device 4 would access the ORBIT
16 database to determine if the patent is currently
17 involved in a pending litigation using such databases
18 as the LITALERT Database, or whether the patent is
19 under reexam or reissue using such ORBIT databases as
20 LEGAL STATUS or PATENT STATUS. Database access and
21 collection device 4 could also access the LEXIS/NEXIS
22 database to determine whether any newspapers have
23 published any current information regarding the patents
24 as well as determining whether the patent has been
25 involved in previous lawsuits by accessing the legal
26 reporter files.

27 Finally, database access and collection device 4
28 can also access a full-text patent database such as
29 DIALOG to either collect the necessary information
30 directly from DIALOG or to obtain the patents
31 themselves. The types of patent information which

1 would provide important information could be of two
2 forms. The first type of information would be patent
3 information derived directly from the patents. Such
4 information would include number of claims, the length
5 of the independent claims, number of references cited,
6 number of classes searched, whether the patent is a
7 reissue or reexam, number of years until patent expires
8 or in which group the patent was examined. In
9 addition, the indicators may include whether the
10 inventor(s) is a U.S. or foreign citizen, or whether
11 the current owner is U.S. or foreign based. Further,
12 information regarding U.S. or foreign priority, and
13 whether the cited references have publication dates
14 near the priority dates could also be considered.

15 The second type of information would not be
16 derived from the patent itself, but would be
17 information derived from other patents. For example,
18 this information might be how often the patent being
19 acquired has been cited as a reference for other
20 patents.

21 Similar information could also be collected for
22 trademarks which are included in the intellectual
23 property portfolio from such databases as DIALOG's
24 FEDERAL TRADEMARK SCAN and STATE TRADEMARK SCAN which
25 inventory federal and state trademarks, respectively.
26 Based upon these databases, a user might, for example,
27 determine whether a trademark includes disclaimers to
28 certain words in the trademark and/or how many classes
29 the trademark has been issued for or covers. In
30 addition, ORBIT's LEGAL STATUS database includes recent
31 information affecting the trademark, and LEXIS' NEXIS

1 database could be used to determine any recent
2 information relating to the trademark which has been
3 published in trade magazines or newspapers.

4 Finally, intellectual property which also includes
5 copyrighted work could also be considered in a similar
6 manner. For example, computer software related
7 intellectual property might include both patents on the
8 computer system as well as copyrights on the software
9 itself.

10 Database access and collection device 4 may be any
11 standard device which may interface with the various
12 other databases using, for example, software which is
13 able to mimic or compatible with the software systems
14 of the various databases. Accordingly, database access
15 and collection device 4 may include, for example, the
16 data collection system in U.S. Patent 3,810,101 or the
17 information retrieval system in U.S. Patent 4,064,490, ^{WO}
18 incorporated herein by reference. Additionally,
19 database access and collection device 4 may also
20 include, for example, the machine translation system in
21 U.S. Patent 4,814,988 or the computer method for
22 automatic extraction of commonly specified information
23 from business correspondence in U.S. Patent 4,965,763, ^{WO}
24 incorporated herein by reference.

25 The collected information, including, for example,
26 the first and second types of patent information
27 discussed above, are then transmitted to data processor
28 6 to process the collected data. The data which does
29 not require processing in data processor 6 may be
30 simply passed to indicator weighing device 8. Data
31 processor 6 would then process the collected data as

1 follows: For each of the above indicators, data
2 processor 6 would assign an importance factor, based
3 upon predetermined data stored in empirical database
4 12, for each of the indicators indicating the
5 importance of the collected data with respect to each
6 indicator. Data processor 6 may include any standard
7 data processor such as the 386 data processor
8 manufactured by various companies including Intel and
9 may include the various functions of the artificial
10 intelligence system in 4,670,848, incorporated herein
11 by reference.

12 Empirical database 12 may be a single database
13 storing all the required empirical data, or empirical
14 database 12 may be comprised of several smaller
15 databases each storing different required data used by
16 the intellectual property audit system of the present
17 invention. Empirical database may be any standard
18 database and may include, for example, the data storage
19 and processing apparatus in U.S. Patent 3,911,403, ^{PO}
20 incorporated herein by reference.

21 For example, if data access and collection device
22 4 searched the DIALOG database and collects information
23 that a specific patent has been cited over 100 times,
24 i.e., a citation indicator, data processor 6 might
25 assign an importance factor of 10 on a scale of 1 to 10
26 to the citation indicator. Similarly, if database
27 access and collection device 4 determines that the
28 patent was searched in only one class for the class
29 indicator, data processor 6 might assign a 1 on a scale
30 of 1 to 10 to the class indicator. Note that
31 currently, both the class and citation indicators have

1 the same relative importance. As discussed above, data
2 processor 6 determines the 10 value for the citation
3 indicator and the 1 value for the class factor by
4 comparing the indicators to predetermined indicators
5 having predetermined values. These predetermined
6 indicators are based upon collected known indicators
7 from known intellectual property portfolios.

8 The determined worth indicators are then
9 transmitted to an indicator weighing device 8 which
10 prioritizes each of the indicators against each other
11 based upon predetermined weighing schemes which have
12 been determined from known portfolios by also
13 consulting empirical database 12. For example, the
14 citation indicator may be more important, for example
15 twice as important, than the class indicator based upon
16 predetermined experience.

17 The weighted indicators are transmitted to
18 indicator comparing device 10 which compares the
19 collection of worth indicators to known collections of
20 worth indicators from known intellectual property
21 portfolios by consulting database 12 storing the
22 empirical data. Known distribution or estimation
23 techniques could be used to determine the closest
24 matching known intellectual property portfolio to the
25 intellectual property portfolio which is to be
26 acquired. Finally, the system would output the known
27 value for which the portfolio to be acquired matches
28 the most signifying a rough approximation of the worth
29 of the portfolio to be acquired. The output may be
30 displayed on any display, such as the display systems
31 for electronic data processing equipment in U.S. Patent

3,820,080, incorporated herein by reference.

In addition to the above features, the present invention also includes the feature of manual assistance processing in the event the process of the present invention fails for known or unknown reasons. Accordingly, when a failure occurs, a notice is generated to a predetermined location where manual assistance may be performed. Each of data input device 2, database access and collection device 4, data processor 6, indicator weighing device 8, indicator comparing device 10 are programmed to output manual assistance requests to different locations or the same location depending on whether the manual work force must be spread over more than one location. Thus, the present invention is also able to effectively correct failures in the processing of the intellectual property portfolio in order that the process continue to determine an intellectual property portfolio worth indicator. Thus, manual assistance may be performed for different aspects of the processing, and the processing may be restarted in a standard manner for the determination of the intellectual property worth indicator.

Advantageously, the present invention also utilizes comparison techniques using neural network pattern matching processes. The specific types of pattern matching techniques implemented by the comparison system/device which have already been tested and shown to provide excellent results are the standard Kohonan and the Back Propagation neural networks, see, for example, U.S. Patents 5,146,541 and 5,303,330,

1 incorporated herein by reference. However, other
2 pattern matching techniques could also be used,
3 depending on the required application. In each type of
4 comparison, a neural network is selected that is
5 suitable to the requirements of the application. The
6 Kohonan and Back Propagation networks are discussed
7 below.

8 The Kohonan neural network is useful in grouping
9 similar patterns. The primary benefit of the Kohonan
10 neural net as the basis for finding duplicate
11 information is that it does not require training. The
12 neural network is built and the categories are created
13 as the entries are provided to the Kohonan neural net.
14 When a Kohonan neural network was used with the Neural
15 Pattern described earlier in connection with Fig. 18,
16 effective results are provided for small population
17 sizes.

18 In a Kohonan neural network each entry is fed into
19 the network and a value is returned. By keeping track
20 of the output numbers, entries with similar output
21 numbers are grouped as similar. One disadvantage of
22 the Kohonan neural network is that it may be moderately
23 slow and is somewhat ineffective using large
24 populations of entries. That is, as the number of
25 entries in the system increases, its ability to
26 effectively group similar data decreases.

27 The Back Propagation neural network is a trainable
28 network. Using this method the entries are fed into
29 the network in a first pass, which creates the neural
30 pattern. Then a second pass is made with each entry to
31 determine which values are to be compared. The second

1 pass thereby indicates to what extent the current entry
2 matches any of the entries in the population. There is
3 a guarantee that the entry will at least match on
4 itself within the population.

5 The Back Propagation network is created by
6 creating an input/output array with as many slots as
7 there are entries. For example, if there are 2000
8 entries in the population, then a 2000 slot
9 input/output array is created. For each entry that is
10 entered into the Back Propagation network, a second
11 array is provided indicating which entry in the
12 sequence it is. The first entry in the input/output
13 array is indicated by setting the first slot to 1 and
14 the remaining slots to 0. The second entry is
15 indicated by setting the second slot to 1 and the
16 remaining slots to 0, and so on.

17 When the entire Back Propagation network is
18 trained with the entries, a second pass is made to
19 evaluate each entry against the population. In the
20 evaluation phase, each entry is passed through the
21 network along with an empty input/output array. The
22 Back Propagation network fills in the array with a
23 value between 0 and 1 for each slot. A value of 1
24 indicates an exact match and a value of 0 indicates no
25 match whatsoever. By scanning the input/output array
26 for each entry in this manner, a table can be built of
27 each entries comparative value with all the entries in
28 the population. Any threshold can be set to consider a
29 match relevant as potential duplicate or fraudulent
30 data. For example, a .5 can be considered a relevant
31 match. In this case if an entry matches any other with

1 a value of .5 or greater, it is considered a potential
2 duplicate.

3 The advantages of the Back Propagation network are
4 that it provides a relative ranking of entries and
5 their matches with other entries in a population, and
6 that it can easily be extended to other types of
7 comparison-related applications. As compared with the
8 Kohonan, this neural net method provides a value that
9 indicates the extent one entry matches another. This
10 can be used to provide different thresholds for
11 indicating a match. This method can also be used for a
12 wide variety of comparison-related problems. In cases
13 where a match on similar values is required without
14 necessarily grouping items, this method can be used as
15 opposed to the Kohonan. For example, in many companies
16 there is a need to find employees that are acting as
17 vendors to the company, since this is likely a conflict
18 and may potentially be the basis of fraud. However,
19 the name, address, social security number or other
20 information of how the employee is registered as a
21 vendor will likely be varied from the way the employee
22 is registered as an employee (e.g., in the human
23 resource system). To find such conflicts a Back
24 Propagation network can be built using the entries of
25 the human resource system, i.e., the employee database.
26 Then, each entry of the vendor database can be used to
27 find whether there is a relative match in the employee
28 database. Since the entries are translated into one of
29 the neural-based patterns, the Binomial neural network
30 will identify similar entries and match on employees
31 that have slightly altered their identification as

1 vendors in the vendor system.

2 Kohonan and Back Propagation Neural Networks are
3 standard and may be implemented by, for example,
4 NEUROWINDOWS: Neural Network Dynamic Link Library,
5 manufactured by Ward Systems Group, Inc., the manual of
6 which is incorporated herein by reference. Similar
7 networks are also disclosed, for example, in Caúdll,
8 M., The Kohonan Model, Neural Network Primer, AI
9 Expert, 1990, 25-31; Simpson, P., Artificial Neural
10 Systems, New York, NY, Pergamon Press, 1990; Wasserman,
11 P., Neural Computing Theory and Practice, New York, NY,
12 Van Nostrand Reinhold, 1989; Specht D. and Shapiro, P.,
13 Generalization Accuracy of Probalisitic Neural Networks
14 Compared With Back-Propagation Networks, Proceedings of
15 the International Joint Conference on Neural Networks,
16 July 8-12, 1991, 1, 887-892, all of which are
17 incorporated herein by reference.

18 Figs. 3-6 are block diagrams illustrating
19 additional embodiments of the pattern matching system.
20 In these embodiments, the hardware configuration is
21 arranged according to the multiple instruction multiple
22 data (MIMD) multiprocessor format for additional
23 computing efficiency. Fig. 3 uses a more distributed
24 database approach, whereas Fig. 4 uses a central
25 database. Fig. 5 uses a similar approach across a
26 public switched telephone network, and Fig. 6 uses a
27 distributed approach where the different systems are
28 cross coupled in a standard fashion. The details of
29 this form of computer architecture are disclosed in
30 greater detail in, for example, U.S. Patent No.

1 5,163,131, Boxer, A., Where Buses Cannot Go, IEEE
2 Spectrum, February 1995, pp. 41-45; and Barroso, L.A.
3 et al., RPM: A Rapid Prototyping Engine for
4 Multiprocessor Systems, IEEE Computer February 1995,
5 pp. 26-34, all of which are incorporated herein by
6 reference.

7 Fig. 7 is an illustration of ^{a computer 218} ~~main central~~
8 ~~processing unit 18~~ for implementing the computer
9 processing in accordance with one embodiment of the
10 present invention. In Fig. 7, computer system 218
11 includes central processing unit 234 having disk drives
12 236 and 238. Disk drive indications 236 and 238 are
13 merely symbolic of the number of disk drives which
14 might be accommodated in this computer system.
15 Typically, these would include a floppy disk drive such
16 as 236, a hard disk drive (not shown either internally
17 or externally) and a CD ROM indicated by slot 238. The
18 number and type of drives varies, typically with
19 different computer configurations. The computer
20 includes display 240 upon which information is
21 displayed. A keyboard 242 and a mouse 244 are
22 typically also available as input devices via a
23 standard interface.

24 Fig. 8 is a block diagram of the internal hardware
25 of the computer 218 illustrated in Fig. 7. As
26 illustrated in Fig. 8, data bus 248 serves as the main
27 information highway interconnecting the other
28 components of the computer system. Central processing
29 units (CPU) 250 is the central processing unit of the
30 system performing calculations and logic operations
31 required to execute a program. Read-only memory 252

1 and random access memory 254 constitute the main memory
2 of the computer, and may be used to store the
3 simulation data.

4 Disk controller 256 interfaces one or more disk
5 drives to the system bus 248. These disk drives may be
6 floppy disk drives such as 262, internal or external
7 hard drives such as 260, or CD ROM or DVD (digital
8 video disks) drives such as 258. A display interface
9 264 interfaces with display 240 and permits information
10 from the bus 248 to be displayed on the display 240.
11 Communications with the external devices can occur on
12 communications port 266.

13 Fig. 9 is an illustration of an exemplary memory
14 medium which can be used with disk drives such as 262
15 in Fig. 8 or 236 in Fig. 7. Typically, memory media
16 such as a floppy disk, or a CD ROM, or a digital video
17 disk will contain, inter alia, the program information
18 for controlling the computer to enable the computer to
19 perform the testing and development functions in
20 accordance with the computer system described herein.

21 Finally, it should be noted that the various steps
22 of the present invention are performed in hardware.
23 Accordingly, each step of the present invention
24 typically generates an electrical signal which
25 represents a result of a specific step performed by
26 each of the above elements in Figs. 1 and 2.
27 Accordingly, the above discussion represents the
28 electrical signals which are generated and used in the
29 various procedures of the present invention.

30 The many features and advantages of the invention
31 are apparent from the detailed specification, and thus,

1 it is intended by the appended claims to cover all such
2 features and advantages of the invention which fall
3 within the true spirit and scope of the invention.
4 Further, since numerous modifications and variations
5 will readily occur to those skilled in the art, it is
6 not desired to limit the invention to the exact
7 construction and operation illustrated and described,
8 and accordingly, all suitable modifications and
9 equivalents may be resorted to, falling within the
10 scope of the invention.

11 What is claimed is: